IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

JILL STEIN, et al., Plaintiffs, v. KATHY BOOCKVAR, in her official capacity as Secretary of the Commonwealth, and JONATHAN MARKS, in his official capacity as Commissioner of the Bureau of Commissions, Elections and Legislation, Defendants.	CIVIL ACTION No. 16-cv-6287(PD)

DECLARATION OF DEAN C. BAUMERT IN SUPPORT OF DEFENDANTS' OPPOSITION TO PLAINTIFFS' MOTION TO ENFORCE THE SETTLEMENT AGREEMENT

I, Dean C. Baumert, declare under the penalty of perjury pursuant to 28 U.S.C. § 1746 that:

I am a Principal Product Manager for Election Systems & Software, LLC ("ES&S"). I make this declaration in support of Defendants' Opposition to Plaintiffs' Motion to Enforce the Settlement Agreement.

I am the Product Manager responsible for all touchscreen marking and tabulating products for ES&S. I have also served ES&S in project, development, and product management roles across all of the ballot scanner/tabulator products including leading the development and implementation of ES&S' ExpressVote XL machine described below. I have prior industry experience in engineering,

manufacturing and retail systems including point of sale, pharmacy, merchandising, reporting, logistics and networking.

I. ES&S's Position in the Marketplace

1. ES&S provides voting machines to approximately 30% of the nation's more than 10,000 voting jurisdictions. ES&S is 100% American-owned and, over more than thirty years, has grown into an industry leader with solutions for each step of an election.

2. ES&S has engaged in continuous investment in research and development, resulting in new and improved voting technology (built with the highest standards of security) that helps election officials conduct secure and successful elections. One example of such voting technology is the ExpressVote XL.

3. The ExpressVote XL is a ballot marking device that incorporates into a single unit the printing of a voter's selections as a paper voter-verifiable record and tabulation scanning.

4. A publicly available video demonstration of the ExpressVote XL is available at https://essvote-1.wistia.com/medias/4xu5p0uql4.

II. The ExpressVote XL - Testing, Approval and Success

5. ES&S values transparency and works closely with all levels of the U.S. government, academia, and other experts to ensure the integrity of votes being cast on its voting machines.

6. ES&S has invited and welcomed numerous experts and government officials, including critics, to see its operations first-hand and to discuss potential improvements.

7. ES&S actively collaborates with the U.S. Department of Homeland Security; has all of its equipment certified through the U.S. Election Assistance Commission ("EAC"), a federal agency created by the bipartisan Help America Vote Act of 2002; and voluntarily takes part in many other collaborations with groups and individuals interested in protecting America's voting systems.

a. EAC & State Certification

8. Voting machines provided by ES&S are certified by the EAC and undergo robust testing for accuracy, reliability, usability and security conducted by accredited independent testing authorities. The ExpressVote XL is no exception.

9. ES&S voluntarily adheres to the EAC's Federal Testing Program. Under that Program, ES&S submits all of its systems to voting system test laboratories accredited by the National Institute of Standards and Technology ("NIST"). These labs perform tests in accordance with the federal voting system

standards. EAC-certified systems are required to complete testing with zero errors in over one and one half million marked selections.

10. In addition to the mandatory reviews conducted under the Federal Testing Program, several states also engage independent firms to audit the security of voting machines as part of the certification process in their states.

11. The ExpressVote XL has been state certified in California, Delaware, Mississippi, New Jersey, Pennsylvania and Texas.

12. The ExpressVote XL has undergone thousands of hours of testing, including usability testing; has been certified by the EAC; and has passed certification and extensive testing by the Pennsylvania Department of State on two separate occasions.

13. The EVS 6.0.0.0 voting system release includes ES&S' Electionware Election Management Software (EMS), precinct-ballot scanner/tabulators, high-speed central ballot scanner/tabulators, as well as touch screen ballot marking and tabulating products that include the ExpressVote XL. As part of this certification, the ExpressVote XL was subject to extensive accessibility, reliability, accuracy, security and other testing outlined in the EAC's Voluntary Voting System Guidelines ("VVSG") version 1.0, to which all voting systems being offered to Pennsylvania must be certified.

14. EVSS 6.0.0.0 satisfied those testing requirements and received EAC certification on July 2, 2018, establishing its compliance with VVSG federal standards. Each ES&S release undergoes extensive security testing and ES&S submits a complete set of software components to the voting systems testing labs for review.

15. The ExpressVote XL has been part of the EAC certification testing process for EVS voting system releases 6.0.0.0, 6.0.2.0, 6.0.2.1, 6.0.4.0 and 6.1.0.0. Each release has been certified as compliant with the VVSG 1.0. *See* Election Assistance Commission, Certified Voting Systems, *available at* https://www.eac.gov/voting-equipment/certified-voting-systems/ (last visited December 10, 2019).

b. Pennsylvania Certification

16. ES&S submitted its first request for certification of the EVS 6.0.0.0 voting system by the Pennsylvania Department of State on May 16, 2018.

17. The Department and the state examiner (SLI Compliance – an independent Voting System Test Laboratory (VSTL) accredited by the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 200733-0: TESTING), https://www.slicompliance.com/) scheduled an examination of EVS 6.0.0.0 between June 25-28, 2018 to determine its compliance with Article XI-A of the Pennsylvania Election Code. The examination included six main areas: (1)

source code review; (2) documentation review; (3) system level testing; (4) security/penetration testing; (5) privacy analysis; and (6) usability analysis. The functional examination was open to the public and was videotaped by Department staff.

18. As a result of the examination, several enhancements were made to facilitate proper handling of Pennsylvania's straight party voting method on the ExpressVote and ExpressVote XL. In addition, performance enhancements were made to the Electionware Reporting module which reads in results media from the voting machines and generates all jurisdiction-required election reports. EVS 6.0.2.1 voting system incorporated those enhancements into an updated release. The system components remained the same; the only change in the new release were the aforementioned software enhancements.

19. EVS 6.0.2.1 voting system underwent independent testing in September 2018 to obtain EAC certification and certification by the Pennsylvania Department of State. The Department's examiner determined that the EVS 6.0.2.1 voting system release complied with Article XI-A of the Pennsylvania Election Code and certified it on November 30, 2018. Likewise, on November 12, 2018, the EAC certified that EVS 6.0.2.1 complied with VVSG.

20. As a result of a petition by a group of individuals on July 17, 2019—over eight months after the certification by the state—the Pennsylvania Department of State undertook a re-examination of the ExpressVote XL.

21. The Department's examiner, SLI Compliance, again performed a security review, functional review and documentation review of the ExpressVote XL on August 7 and 8, 2019. The re-examination focused on the petitioners' allegations that the ExpressVote XL violated Sections 1107-A(1) and (12) of the Pennsylvania Election Code, 25 P.S. § 3031.7(1) & (12).

22. The Department and its examiner again determined that the ExpressVote XL satisfies the requirements of the Election Code and maintained its certification.

c. Additional Testing & Security Procedures

23. In addition to the above testing and certification steps, extensive testing of the voting system is performed before each election. For all types of ballots, jurisdictions perform pre-election logic and accuracy tests and post-election audits to ensure the accuracy of the tabulation process. Logic and accuracy tests verify the readiness of the system for the specific election to be conducted.

24. A post-election audit also verifies that the equipment and procedures used to count votes during an election worked properly, and that the election yielded the correct outcome. Logic and accuracy testing and post-election auditing

provide a testable and auditable method to verify that ballots are programmed correctly and counted as the voter intended.

III. The ExpressVote XL is Based on a Secure Design

25. Every election reinforces the importance of voting as the foundation of America's democracy. Nothing is more important to ES&S than maintaining the integrity of the voting process.

26. Plaintiffs' declarant states that it is "feasible for malware to cause the machines to print bar codes that corresponded to candidates the voter did not select." Declaration of Alex Halderman dated November 21, 2019, ("Halderman Decl.") ¶ 8. The declarant also claims that "it would be feasible for malware to compromise [the tabulator] and cause paper records that have been rejected by voters to be tabulated as well as those that have been accepted by voters." Halderman Decl. ¶ 7. Such a compromise of the system is not feasible as a practical matter.

27. There is no record that any of the hypothetical malicious cybersecurity breaches Plaintiffs describe have ever taken place, either in actual elections or in testing of the ExpressVote XL. The design of the ExpressVote XL, coupled with all the other layers of security that protect ES&S's voting systems, means that any of these breaches are a practical impossibility.

28. Election systems provided by ES&S employ a concept called "security in depth" which utilizes layers of overlapping security measures to ensure that the compromise of a single protection feature does not result in the compromise of the system's integrity.

29. System-level protections include hardened software for programming the election, encryption and digital signing of data to and from the machines, use of authorized data transfer media, and locks and seals for physical protection.

30. Voting machines that are a part of this system utilize many of these same measures to prevent "hacking" or cybersecurity compromises. In addition to those mentioned, voting machines certified to the VVSG1.0 standard are never connected to the internet.

31. ES&S voting machines also have multiple layers of security on the data, including unique encryption keys for every election. The machines will only accept the certified type of USB media and will ignore all other types. The machines also verify that the media has been programmed for the expected purpose, was programmed by the trusted software, and has not been modified in any way.

32. The ExpressVote XL provides the VVSG-required ability to validate the operating system and application software installed on the machine, allowing for audits before and after each election.

33. All election programming data is stored and encrypted until it is loaded into random access memory for use during machine operation. At such time, its digital signature is validated to confirm that the data is from the trusted source and has not been altered. All vote and results data generated is encrypted and digitally signed.

34. The ExpressVote XL generates its own public/private key pair for each election and digitally signs each artifact (log files, vote records, results files, etc.) generated by the device during the election. The digital signatures are validated by the system before any artifact is processed, ensuring that should unauthorized access of a unit occur, it will be detected and reported to the user so no other units can be affected through data transfer.

35. The ExpressVote XL generates a detailed audit log of all actions and events that have occurred on the unit, which can be printed at any time. Every action and event, including access attempts, access of system functions and errors is logged and timestamped. The log is digitally signed each time it is updated to allow detection of any potential tampering with the entries. The vote data is encrypted and digitally signed.

36. ES&S also conducts thorough security reviews of its entire supply chain to ensure that every component is trusted, tested and free of malware. Every single item and manufacturer is approved and under engineering revision control to

ensure that only authorized components and firmware are used in the production of voting machines.

37. Moreover, even in the extremely unlikely circumstance that these security measures were breached, such breach would be identified in a post-election recount or audit. Because the ExpressVote XL provides a voter-verified paper record of every vote, election officials would be able to accurately recount the votes using the verified paper record.

IV. The ExpressVote XL Matches the Barcode on the Paper Record to the Candidate Names

38. ES&S considers paper records to be critical for auditing. As such, in 2018 ES&S decided to no longer sell paperless voting machines as the primary voting device for any jurisdiction given that it is difficult to perform a meaningful audit without a paper record of each voter's selections. Using a physical paper record sets the stage for all jurisdictions to perform statistically valid post-election audits should they choose.

39. The paper record of votes created by the ExpressVote XL includes both printed candidate names and barcodes that are read by a tabulator. Barcodes are a trusted, tested, universal technology used in a variety of ways across many different industries to improve safety, accuracy, speed and efficiency. DMVs, pharmacies, hospitals, banks and food manufacturers all use barcodes. They are

reliable and have been used commercially for more than 50 years. They are used extensively in the medical field where errors could be catastrophic.

40. A barcode is a pattern code—a group of lines or blocks and spaces that represent specific characters—that computers can read automatically to identify information in a database. Because barcodes offer a reliable way to accurately read information, the technology eliminates the possibility of many kinds of human error (e.g., poorly marked ballots) and provide a layer of tamper resistance, as they are virtually unmodifiable, especially when employing a check digit or signature. Displayed along with human-readable text, summary cards with barcodes are fully auditable.

41. Whether votes are cast on a hand-marked paper ballot or a machine-marked paper ballot, when paper ballots are tabulated by machines, barcodes are used to count votes.

42. Both hand-marked paper ballots and machine-marked paper ballots are secure methods of casting a vote. Vote counting machines (called tabulators) are used in both instances and read barcodes in the same way they read the oval positions on a paper ballot; thus, a summary card with barcodes contains the same essential data as on a hand-marked ballot. In the case of both hand-marked and machine-marked paper ballots, these lines translate to numbers that are grid

coordinates and those grid coordinates correspond to a candidate name in a database.

43. On a hand-marked paper ballot, often referred to as an oval-filled ballot, voters make their choices by filling in by hand the ovals next to their desired selection. When tabulating a hand-marked paper ballot, the system works as follows:

a. There is a barcode, typically called a code channel, along the left edge of the ballot and the top and/or bottom of a hand-marked paper ballot that indicates the ballot that is being counted.

b. When a voter hand marks the oval next to a particular candidate and inserts the hand-marked paper ballot into a tabulation machine, that tabulation machine does not read the candidate's name.

c. In fact, the tabulation machine does not recognize the text of the candidate's name at all, nor does it even determine that the oval position for a particular candidate is next to the candidate's name. Instead, the tabulation machine reads the code channel to determine the ballot being read and then retrieves the programmed location of all of the ovals. It then reads the ovals and sends a list of the oval positions that are marked.

d. Even though the candidate's name appears on the ballot, it is actually the name in the database corresponding to the programmed oval position for which a vote is recorded.

44. Machine-marked paper ballots work the same way, except that the voter makes their choices by touching a screen by hand, or by using an assistive device, instead of holding an ink pen. For example:

a. When the voter selects a particular candidate's name on the touch screen, the marking device prints out a paper record with

the text of the candidate's name along with a barcode corresponding to the coordinates of that candidate's location.

b. When the paper record is inserted into the tabulator, the tabulator performs the same actions as it does with the hand-marked paper ballot. It reads the master barcode, which performs the same purpose of identifying the exact ballot style being counted. It then reads the selection barcodes and returns a list of marked candidate locations.

c. The candidate names in the database corresponding to each of the positions returned has a vote recorded for those candidates.

45. Just as in the case of hand-marked paper ballots, the tabulation machine in the ExpressVote XL is only looking for grid coordinates. The casted vote records from both examples are identical.

46. A mismatch between the barcode on the paper record and the words on the paper record has never occurred on an ExpressVote or an ExpressVote XL, although it has happened many times on oval-filled ballot systems.

47. For oval-filled ballots, such an aberration could occur in two ways. First, the election coding could be changed after the ballots are printed, such that the machine is programmed with coding that does not match the printed ballots. If testing is not performed correctly, the discrepancy will not be caught. Second, if oval-filled election ballots are created by hand and the coding (i.e., the locations of the ovals) is manually programmed to match this layout, human error can cause a discrepancy.

48. These aberrations are not possible for the ExpressVote or the ExpressVote XL, because the ballot is not pre-printed, and the ballots and coding are sent as part of the same data set to the machine.

49. In the case of both a hand-marked ballot and a ballot marked by a ballot-marking device ("BMD"), the voter can only validate the human-readable content. The voter cannot determine that the tabulator portion of the process correctly captured their intent and properly assigned the votes to the proper candidates. The ExpressVote XL does, however, allow a voter to read the selections encoded in the barcodes back to them using the display or audio capabilities which provide a verification that typical ballot scanners do not provide for oval-filled ballots.

V. The ExpressVote XL Printer Does Not Touch the Paper a Second Time After the Barcode is Affixed.

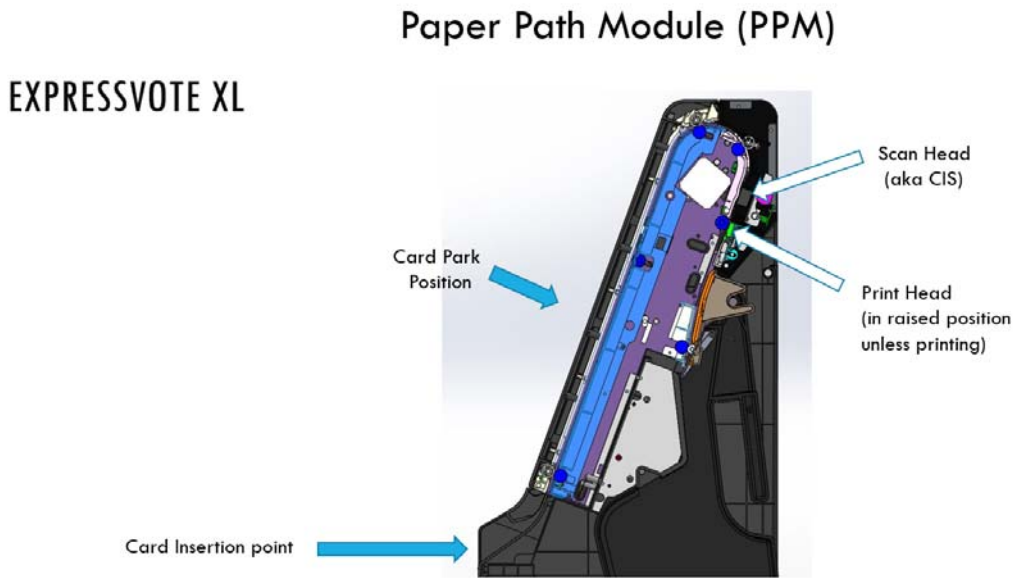
50. As Plaintiffs' declarant states, after the voter verifies his or her selections on the paper record, the paper record passes back through the machine on its way to a collection bin. Halderman Decl. ¶ 6. The declarant continues that "[i]t would be feasible for malware to tamper with this function and cause the printhead to add additional races or selections to the paper after the voter has reviewed it." *Id.* This is not plausible, for several reasons.

51. The ExpressVote XL creates a paper ballot based on a voter's selections, which is tabulated when the voter affirms that he/she is ready to cast. It

allows voters to review their selections before printing for tabulation on scanners. The print head is located such that, after the initial print, the vote summary record passes to the collection bin without making contact with the print head again during the vote summary record deposit process.

52. To ensure that the printer does not touch the paper again after the voter certifies, the print head has sensors to indicate that it has been raised off the path, and it would generate an error if it did not successfully raise. In addition, the paper moves more quickly when it moves under the printer after verification. If the printer was in the down position when the card was passed through while being cast into the bin, the paper transport motor would stall, and the result would be a card jam. That would raise an error. The print head is always raised from the paper path when not printing. Images of this aspect of the ExpressVote XL are below:

53. 



54. Further, the printing process is audible and therefore able to be detected.

55. Even if the print head touched the paper as it passed through a second time, it is extremely unlikely that this could alter a vote. First, the printer prints the

card from bottom to top. Any over-printing as the card is ejected would require the printing to occur from top to bottom. Second, the barcodes that are used include a check digit, such that the barcode is nearly impossible to modify. Finally, to do so would require that the card pass through the paper path with no shifting or skewing, which is also virtually impossible.

56. In addition, the system can be programmed to leave no spaces between human-readable contest or candidate text, such that there is no available space to add a human-readable selection.

57. Finally, the master barcode indicates the number of selection barcodes that are present. If a barcode were added, subsequent scans would fail validation, and the added barcode would be detected.

58. The ExpressVote XL design renders it is extremely unlikely that an erroneous vote (i.e., one that the voter rejected) could nonetheless be tabulated. Such a scenario would require the voting machine's security to be compromised, which is equally possible on oval-filled ballot scanners, and, indeed, on any system that relies on technology for tabulation of votes.

59. Finally, in the nearly impossible scenario that a malicious agent could somehow evade all of these security features, the discrepancy between the human-readable record and the altered bar codes would be easily detectable in an audit.

VI. The Northampton Election is Not a Basis to Decertify the ExpressVote XL Statewide

60. The issues affecting the 2019 election in Northampton County are unrelated to the complaints that Plaintiffs now assert in their motion. Notably, the ExpressVote XL was used successfully in Philadelphia's 2019 elections.

61. There were two issues with the 2019 Northampton County election. First, some contests reported incorrect results for some candidates. The paper ballots printed by the ExpressVote XL were used as a backup, and those ballots were used to correctly tabulate the votes.

62. Thorough analysis and extensive testing following the election established that the issue was caused by a ballot layout technique that had not been properly tested and that caused the system to not attribute votes to certain candidates.

63. In particular, the ballot included instructional text on the ballot. Although the ballot was displayed correctly on the screen and on paper ballots, the instructional text error created a misalignment in the database that resulted in votes not being attributed to candidates in a particular position relative to the instructional text. This was confirmed through testing that replicated the exact ballot used in Northampton County.

64. In this replication, although the voter's selections displayed correctly on the screen and on the printed ballot, the system assigned the votes to the

instructional text, thereby preventing the votes from registering for the intended candidate.

65. When the instructional text was removed in a recoded version of the election made for analysis purposes, the results were captured accurately and showed all of the corresponding vote totals for all candidates. This instructional text issue was ultimately human error in using a layout technique that was not fully tested. Tabulators like the high-speed scanners used by the customer do not display the ballot and do not consider the instructional text; they therefore counted the votes without issue by simply rescanning the paper ballots printed by the ExpressVote XL.

66. Second, some voters reported difficulty in making selections on the machines' touchscreens. In particular, some voters reported that their touch was not registering the proper location, or at all, and that the touch screen was too sensitive. They were nonetheless able to verify their votes with the paper ballots printed by the ExpressVote XL.

67. Extensive testing indicated that the primary cause of difficulties with the touch screen displays was that some machines (as many as 30%) were configured improperly at the factory prior to delivery to Northampton County. In addition, the layout of the ballot unnecessarily pushed voting selection areas to the very edge of the touch screen where the screens can be less responsive.

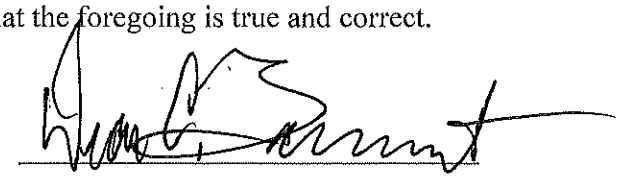
68. The ExpressVote XL uses infrared touch screen technology. Because the sensors cover the entire border, it is possible for selections within the border area to not register properly. Small boxes within the candidate selection box may have also caused an inadvertent selection, by prompting voters to make selections that were on the "border" of another selection option. These issues will be resolved with an improved ballot layout and corrected machine configuration.

69. Despite the issues with that specific election, the results, as obtained through the ExpressVote XL machines, were still verifiably accurate. Each voter had the opportunity to read and verify their ballot before they cast it, and the paper ballots that the voters read were used to tabulate the total.

70. In addition, the paper ballots were scanned, tabulated by election officials, and audited for accuracy. The audit confirmed the accuracy of the election results.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on DECEMBER 12, 2019.



Dean C. Baumert